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Emerging Markets Instability: Do Sovereign Ratings Affect Country Risk and Stock Returns?

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Abstract

Financial market instability has been the focus of attention of both academic and policy circles. Rating agencies have been under particular scrutiny lately as promoters of financial excesses, upgrading countries in good times and downgrading them in bad times. Using a panel of emerging economies, this paper examines whether sovereign ratings affect financial markets. We find that changes in sovereign ratings have an impact on country risk and stock returns. We also find that these changes are transmitted across countries, with neighbor-country effects being more significant. Rating upgrades (downgrades) tend to occur following market rallies (downturns). Countries with more vulnerable economies, as measured by low ratings, are more sensitive to changes in U.S. interest rates.

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1. Introduction

Worldwide financial market instability has been the focus of attention of both academic and policy circles. Naturally, following the series of currency crashes in the 1990s, most of the discussion has centered on currency crises. The latest crisis in Turkey in February 2001 will certainly contribute to keeping an avid interest in the triggers of crises well into the new millennium. But currency collapses are not the only ones to have attracted attention. The daily volatility of stock and bond markets in non-crisis times have also stirred interest, with, for example, the vagaries of the NASDAQ index in the United States making the daily headlines of newspapers around the globe.

Many have argued that globalization is at the heart of this volatility, with highly diversified investors not paying much attention to economic fundamentals and following the herd in the presence of asymmetric information. (See, for example, Calvo and Mendoza (2000)). Naturally, this argument has provided ammunition to those supporting the re-introduction of capital controls, as argued in Krugman (1998) and Stiglitz (2000). Policies that can lead to moral hazard, including bailouts by both international institutions and governments, have also been suggested as other culprits of financial volatility and financial excesses. (See, for example, McKinnon and Pill (1997) and Dooley (1998)).

The list of culprits does not stop here. Rating agencies have also been under scrutiny lately as promoters of financial excesses. As discussed in Ferri, Liu, and Stiglitz (1999), their pro-cyclical behavior, upgrading countries in good times and downgrading them in bad times, may have contributed to magnifying the boom-bust pattern in stock markets. Even if rating agencies do not behave pro-cyclically, their announcements may still trigger market jitters. This is because most institutional investors can only hold

investment grade instruments (i.e. securities with ratings above a certain threshold). Thus, changes in ratings, downgrading (upgrading) sovereign debt below (above) investment grade, may have a drastic impact on prices, because these rating changes affect the pool of investors.[1] Rating changes may also unveil new (private) information about a country and thus they may fuel rallies or downturns. This effect is likely to be stronger in emerging markets, where problems of asymmetric information and transparency are more severe. Finally, changes in ratings might act as a wake-up call, with rating changes for one country affecting other countries with similar economies.

Research on the effects of changes in sovereign ratings has flourished in the 1990s. This work has mostly focused on the effects of ratings on the instruments being rated. For example, Cantor and Packer (1996) and Reisen and Von Maltzan (1997) and (1999) examine the effects of rating changes of sovereign debt and find a significant effect on bond yield spreads. Similarly, Hand, Holthausen, and Leftwich (1992) show that rating announcements directly affect corporate securities. Richards and Deddouche (1999), using emerging market bank-level data, examine the impact of rating changes on bank stock prices, but do not find statistically significant effects.

Previous research has not examined, however, whether rating changes for one country trigger contagious fluctuations in asset markets in neighboring countries nor has it examined whether ratings for one type of security affect other asset markets. To our knowledge, the only exception is Kaminsky and Schmukler (1999), who examine spillover effects of rating changes, among different types of news, in neighboring

[1] These effects are not just confined to the pool of investors acquiring sovereign debt. When a credit rating agency downgrades sovereign debt of a country, all debt instruments from that country might have to be downgraded accordingly because of the sovereign ceiling doctrine. As a result, commercial banks in the country that turn out to be rated as sub-investment grade can no longer issue internationally recognized

countries and find that news regarding the creditworthiness of a sovereign borrower affects other countries' stock and bond markets.

Cross-country contagion effects can be large, witness the spillover effects of the Russian default on developed and developing countries.[2] Rating agencies may contribute to these comovements in financial markets around the world. Similarly, news for one particular market can affect yields of other securities. These effects can, in some episodes, become quite dramatic, as was the case of the default of the State of Minas Gerais on the Brazilian real. Again, rating agencies may contribute to heighten financial instability.

Neither has previous research examined whether economic vulnerability may trigger a large reaction of domestic financial markets to international events. For example, hikes in world interest rates may affect more drastically countries with economies in distress (with banking fragilities, liquidity problems due to high concentration of short-term debt, or near insolvency) than countries with healthier economies.[3] This "vulnerability" effect may, in fact, explain some conflicting results in the empirical literature that examines international transmission of shocks. For example, Eichengreen and Mody (1998) and Kamin and von Kleist (1999) find that U.S. interest rate shocks do not affect sovereign bond spreads, while Herrera and Perry (2000) find that they do. Interestingly, the Eichengreen and Mody (1998) and Kamin and von Kleist (1999) studies include data only up to 1997 (before the crises) while the Herrera and

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letters of credit for domestic exporters and importers, isolating the country from international capital markets. Similarly, corporations will not be able to issue debt in international capital markets.

[2] The word contagion here is used in a broad sense to denote cross-country spillover effects, regardless of the nature of the shock. For alternative definitions and related papers see www.worldbank.org/contagion.

[3] On a similar vein, Frankel, Schmukler, and Serven (2000) study the transmission of international interest rates to countries with different exchange rate regimes.

Perry (2000) sample includes observations on the crises in Asia, Russia, and Brazil, and thus comprises episodes with very fragile economies.

This paper complements the previous research on rating agencies by also examining these possible cross-country and security-market spillover-effects of rating changes. It also contributes to the literature on contagion and international transmission of shocks by examining the effect of domestic vulnerability, as measured by the ratings of international agencies, on the extent of international spillovers. Our results can be summarized as follows.

First, rating changes significantly affect bond and stock markets, with yield spreads increasing on average 3 percent and stock returns declining about 1 percent following a downgrade.

Second, rating changes also contribute to contagion or spillover effects, with rating changes among emerging markets triggering changes in both yield spreads and stock returns in foreign countries. Still, the effect is smaller than that of rating changes of the domestic economy.

Third, similar to the findings in the literature on contagion, the "contagion" effects of rating changes are of a regional nature.[4]

Fourth, fragile economies, as measured by the international ratings, are more severely affected by changes in U.S. interest rates. In fact, interest rates hikes in financial centers fuel increases in sovereign risk 50 percent larger in vulnerable circumstances, relative to the changes when countries have more healthy economies.

[4] See, for example, Kaminsky and Reinhart (2000a).

Lastly, domestic-country rating upgrades take place following market rallies, while downgrades occur after market downturns. Foreign changes in ratings have a sustained effect.

The rest of the paper is organized as follows. Section 2 describes the methodology. Section 3 presents the data. Section 4 discusses the results. Section 5 concludes.

2. Methodology

To study the effects of ratings and vulnerability, we follow two different methodologies. First, we estimate panel regressions. Second, we perform event studies. The two methodologies are complementary in the sense that they show different aspects of the data.

A. Panel Regressions

The panel estimations study the reaction of country risk and stock returns to changes in ratings and U.S. interest rates. The fact that we use daily data does not allow us to control for country fundamentals, which are typically reported on a monthly or quarterly basis. But we do control for past changes of the explanatory variables. We use only one lag since further lags appear to be insignificant.

We estimate different specifications for both country risk and stock prices. The first specification is the following pooled panel:

$$\Delta Y_{i,t} = a + d' \Delta Y_{i,t-1} + b' \Delta R_t + g' \Delta i_t^{US} + e_{i,t}, \qquad (1)$$

such that $i = 1,...,N$ and $t = 1,...,T$.

$\Delta Y_{i,t}$ represents alternatively the log change in spreads and the log change in stock market prices. The sub-indexes i and t stand for country and time, respectively. The error term $e_{i,t}$ can be characterized by an independently distributed random variable with mean zero and variance $s_{i,t}^2$. We estimate equation (1) using least squares, allowing for heteroskedastic residuals.

ΔR_t stands for the change in ratings. The variable ΔR_t is equal to 1 (-1) if there is an upgrade (downgrade) at time t by any agency on any type of debt (foreign or domestic currency) from any country in the sample. The variable is equal to zero otherwise. If changes in ratings convey new information to market participants, we expect $\hat{b} < 0$ in the regression for country risk; namely, rating upgrades (downgrades) lead to decreases (increases) in country risk. Analogously, in the regression for stock returns, we expect $\hat{b} > 0$.

Δi_t^{US} stands for the change in U.S. interest rates; strictly speaking, the interest rate is $100 \times \log\left(1 + i_t^{US}\right)$. As argued in Kamin and von Kleist (1999), there are different channels through which changes in U.S. interest rates can affect country risk. First, if there is a positive probability that a government will not pay its debt, increases in U.S. rates will prompt a higher rise in the interest rate of the government's debt. The higher increase is to compensate the probability of no repayment. Second, rises in U.S. interest rates increase the burden of the debt, decreasing a country's repayment capacity. Third, increases in U.S. rates can decrease investors' "appetite for risk," reducing the demand for risky assets from emerging countries, thus increasing the country risk. In sum, if increases in U.S. rates lead to higher country risk, we expect $\hat{g} > 0$ in the equation for

country risk. A similar explanation can be argued for stock returns. In fact, governments can levy taxes on corporations if they face higher debt payments. Therefore, we expect that U.S. interest rates negatively affect stock returns, or that $\hat{g} < 0$ in the equation for stock returns.

As a second specification, we estimate:

$$\Delta Y_{i,t} = a + d' \Delta Y_{i,t-1} + b^{i\,\prime} \Delta R^{i}_{i,t} + b^{j\,\prime} \Delta R^{j}_{i,t} + g' \Delta i^{US}_{t} + e_{i,t}. \qquad (2)$$

The variable $\Delta R^{i}_{i,t}$ is equal to 1 (-1) if there is an upgrade (downgrade) at time t by any agency on any type of debt (foreign or domestic currency) from country i. The variable is equal to zero otherwise. The variable $\Delta R^{j}_{i,t}$ is similar to the latter but takes the value 1 (-1) when there is an upgrade (downgrade) in country j for $j \neq i$. That is, this specification tries to examine whether there is a "contagious" effect of credit ratings.

The third specification we estimate is:

$$\Delta Y_{i,t} = a + d' \Delta Y_{i,t-1} + b^{i,dc\,\prime} \Delta R^{i,dc}_{i,t} + b^{i,fc\,\prime} \Delta R^{i,fc}_{i,t} + b^{j,dc\,\prime} \Delta R^{j,dc}_{i,t} + b^{j,fc\,\prime} \Delta R^{j,fc}_{i,t} + g' \Delta i^{US}_{t} + e_{i,t}. \qquad (3)$$

The difference between this specification and the previous one is that we separate the ratings into ratings for domestic-currency debt (*dc*) and ratings for foreign-currency debt (*fc*), both for the domestic and foreign countries, *i* and *j*. If ratings are important, we expect the domestic country foreign-currency ratings (*fc*) to be significant in the equation for country risk, because this is the instrument that credit ratings are evaluating. In other words, we expect a statistically significant $\hat{b}^{i,fc} > 0$. A-priori, the estimated coefficient for domestic-currency debt, $\hat{b}^{i,dc}$, is not expected to affect the country risk, after controlling for changes in foreign-currency ratings. Still, the coefficient for domestic-

currency debt captures an exchange rate risk and may provide further insights into the vulnerability of the economy.

The fourth specification we estimate is:

$$\Delta Y_{i,t} = a + d' \Delta Y_{i,t-1} + b^{i,dc\prime} \Delta R_{i,t}^{i,dc} + b^{i,fc\prime} \Delta R_{i,t}^{i,fc} + b^{r,dc\prime} \Delta R_{i,t}^{r,dc} + b^{r,fc\prime} \Delta R_{i,t}^{nr,fc} + b^{nr,dc\prime} \Delta R_{i,t}^{nr,dc} + b^{nr,fc\prime} \Delta R_{i,t}^{nr,fc} + g' \Delta i_t^{US} + e_{i,t} \quad . \quad (4)$$

The variable $\Delta R_{i,t}^{r,dc}$ is equal to 1 (-1) if there is an upgrade (downgrade) at time *t* by any agency on domestic-currency debt from country *r* (for $r \neq i$). *r* represents a country that belongs to the same geographic region (East Asia, Eastern Europe, and Latin America) as *i*. The variable is equal to zero otherwise. The variable $\Delta R_{i,t}^{nr,dc}$ is similar to the latter but takes the value 1 (-1) for countries outside the geographic region. The variables with the superscript *fc* denote upgrades and downgrades on foreign-currency debt. In this specification we examine whether the "contagious" effect of credit ratings is similar within a region or across regions.

The fifth specification we estimate is:

$$\Delta Y_{i,t} = a + d' \Delta Y_{i,t-1} + b^{i,dc\prime} \Delta R_{i,t}^{i,dc} + b^{i,fc\prime} \Delta R_{i,t}^{i,fc} + b^{r,dc\prime} \Delta R_{i,t}^{r,dc} + b^{r,fc\prime} \Delta R_{i,t}^{nr,fc} + b^{nr,dc\prime} \Delta R_{i,t}^{nr,dc} + b^{nr,fc\prime} \Delta R_{i,t}^{nr,fc} + g^{R\prime} \Delta i_t^{US} + e_{i,t} \quad . \quad (5)$$

This specification is similar to the previous one, but we allow for the vulnerability effect. That is, we use different coefficients, g^R, for the sensitivity to changes in U.S. rates. In particular, we divide the observations into two different groups, observations with low and high ratings. We expect that countries with high ratings should be less affected by changes in U.S. rates due to the three channels described above. (A similar argument can be made for stock returns.) First, given that higher ratings mean a lower probability of default, changes in U.S. interest rates will impact more spreads of countries

with lower ratings. Second, countries with higher ratings tend to have a lower level of debt, so the burden of the debt will increase less in countries with high ratings when U.S. rates increase. Third, if there is a flight to quality when the U.S. rates increase, spread from "riskier" countries (countries with lower ratings) should react more strongly.

The specifications described assume a zero correlation between the error term and the explanatory variables. This correlation may arise if the explanatory variables are endogenously determined. We do not expect changes in U.S. interest rates or changes in ratings to respond to contemporaneous daily changes in emerging market spreads or stock prices. However, a correlation between the lagged dependent variable and the error term is possible. This correlation can arise if the error term is if, for example, the true original model were in levels. In that case, the error term in our equations would be in first differences and correlated with the lagged endogenous variable by construction. To correct for potential biased coefficients, we estimate the more complete specification, equation (5), using instrumental variables. As instruments, we use lagged values of the lagged dependent variable, as suggested by Anderson and Hsiao (1982).

B. Event Studies

The above specifications study the contemporaneous effect of ratings on spreads and stock returns. However, they do not examine any possible dynamic effects of upgrades and downgrades. To have a sense of any dynamic effects that might be taking place, we use event studies. Dynamics effects are interesting because market participants can anticipate changes in ratings. Therefore, the contemporaneous effect might be smaller than the total effect of rating changes. Moreover, credit ratings can act

procyclically, downgrading countries during bad times and upgrading them during good times. We will not be able to disentangle these two observationally equivalent hypotheses, but we are able to observe whether downturns and rallies take place before downgrades and upgrades. Dynamics effects are also interesting because the effect of upgrades and downgrades can dissipate over time.

The event study looks at country risk and stock market spreads (domestic stock markets prices relative to the U.S. S&P500 index) in a 10-day window around an upgrade or downgrade. All spreads and prices are set to 100 at day –10, in that way we can easily measure the cumulative effects over time and we can, at the same time, compare spreads across countries.

To perform the event studies we work with "clean events," i.e. upgrades and downgrades that do not overlap in windows of +/- 10 days. This distinction is important when considering an event window, to be able to isolate the effect of each change in rating. Figure 1 plots the ratings over time for three major rating agencies for a sample of countries. The figure suggests that many upgrades and downgrades across rating agencies occur simultaneously across agencies. In particular, the East Asian countries are downgraded during the Asian crisis and upgraded afterwards. Only few changes take place before the crisis in the case of Malaysia and South Korea.[5]

3. Data

Our data set contains daily series of EMBI spreads, stock returns, interest rates, and credit ratings. We work with 16 emerging markets including East Asian, Eastern

[5] For a detailed study on how ratings are changed, see Cruces (2001).

European, and Latin American economies. The countries are in the data set are: Argentina, Brazil, Chile, Colombia, Indonesia, Korea (South), Malaysia, Mexico, Peru, Philippines, Poland, Russia, Taiwan, Thailand, Turkey, and Venezuela. The data set covers the period January 1990-June 2000. Appendix Table 1 displays the available data for each country and variable.

JP Morgan produces the EMBI and EMBI+ (henceforth EMBI) series for a group of emerging markets, but also on a country-by-country basis. The index by country is a total return index that tracks traded debt instruments denominated in foreign currency. The instruments used are Brady bonds, benchmark Eurobonds, loans, and Argentine domestic debt. The EMBI spreads mostly reflect the difference between each country's sovereign bond yields relative to yields of benchmark instruments issued from developed countries. The spreads are commonly used as measures of country risk or default risk. When the probability of a sovereign default increases vis-à-vis the U.S., bond prices decrease and yield spreads increase. The other variables that we use in this paper, stock returns, interest rates, and credit ratings, were downloaded from Bloomberg. Stock market price indexes for each country are measured in U.S. dollars. We use ratings on sovereign debt issued in domestic and foreign currency. These ratings try to measure the ability of the issuer to pay back its debt. We work with ratings from three major international rating agencies: Moody's, Standard and Poor's, and Fitch-IBCA.

Table 1 provides some measures of financial market instability in our sample. Daily changes (in absolute values) in both markets are large and oscillate around 2.5 percent for sovereign spreads and around 1.6 percent for stocks. Our number of observations is high (about 11 thousand for bond spreads and 22 thousand for stock

prices). Tables 1 and 2 examine the characteristics of the changes in rating in our sample. Table 2 reports the number of upgrades and downgrades per rating agency and Table 3 reports the number of upgrades and downgrades per country. This last table shows that countries with currency collapses during the 1990s, such as Korea, Malaysia, Brazil, and Indonesia, were frequently re-evaluated by rating agencies. Appendix Table 2 shows the scale and type of ratings used by each rating agency.

4. Results

We examine first the impact effect of changes in ratings and then we concentrate on the dynamics aspects of market responses to rating changes.

A. Panel Regressions

The panel regression results for the country risk are reported in Table 4. The columns of the table display the alternative specifications. The first column shows that the coefficient for the lag dependent variable is positive and statistically significant. The coefficient for the changes in ratings (domestic and foreign) is negative and statistically significant, although small when compared to the average daily change in spreads. In days of rating changes, spreads only change by about 0.5 percent while the average absolute change of spreads in our sample is about 2 percent.

The second column examines separately whether changes in domestic ratings have different effects from changes in ratings of foreign countries. Interestingly, we now find that changes in ratings of domestic debt not only have a statistically significant effect, but this effect is also economically important, with rating changes leading to

changes in the spreads of about 2.5 percent. Foreign ratings also matter, but their effect is substantially smaller averaging about 0.4 percent over the sample. Our sample on ratings includes ratings on foreign-currency debt and domestic-currency debt. The first rating captures sovereign risk while the second also makes an assessment of devaluation risk. Since we are examining sovereign yield spreads, ratings on domestic-currency debt should not affect yield spreads once controlled for ratings directly related to country risk. Thus, column 3 examines separately the effects of ratings on foreign- and domestic-currency debt. As expected, ratings on foreign-currency debt are not statistically significant. Moreover, ratings on sovereign debt, once estimated independently from those of domestic-currency debt, have stronger effects on sovereign risk, as captured by the yield spreads. On average, changes in the assessment of rating agencies about country risk lead to spread changes averaging about 3.2 percent.

The crises of the 1990s and the speed at which a crisis in one country engulfed the region and even spread around the globe have spawned a still growing literature on contagion. Much of the research centers on the role of financial links versus trade links. While opinions about the channels of transmission diverge,[6] almost everybody agrees that in several cases contagion has been mostly regional. The Tequila crisis was basically confined to Latin American countries and the crisis in Thailand spread only to Asian economies.[7] We now examine whether these regional contagion effects are also present when we examine contagion effects of credit ratings. The results are reported in columns 4 and 5. Interestingly, regional effects seem to be stronger than those from countries

[6] For example, Kaminsky and Reinhart (2000a) and Kaminsky, Lyons, and Schmukler (2000) have pointed to the role of financial links and have focused on the behavior of international banks and mutual funds. Corsetti, Pesenti, and Roubini (2000) in contrast have focused on the role of trade links.

from other regions, with the within-the-region rating changes leading to an average increase in yields of 0.8 percent while the across-regions rating changes only triggering an average change in spreads of about 0.4 percent. It is the rating agencies' assessment of currency risk (ratings on domestic-currency denominated debt) the one that matters for regional contagion but it is the rating agencies' assessment of sovereign risk the one that matters when assessing across regions spillover effects of ratings.

After Calvo, Leiderman, and Reinhart (1993) brought to the limelight the close relationship between the capital inflows episode to emerging markets during the early 1990s to monetary policy in the United States, the number of papers written on this topic has increased significantly. A large number of papers has focused on the relationship between capital flows or foreign exchange reserves and interest rates in financial centers, others have focused on the links between returns in emerging markets and returns in financial centers. Others, as described in the introduction, have focused on the effects of interest rate hikes on interest rates and country risk. Interestingly, while these links were quite strong in the early 1990s, these links diluted somewhat in the mid-1990s, but reappeared in the late 1990s.

The changing relationship between financial markets in emerging economies and in financial centers is particularly clear in the research studying the determinants of country risk, as examined in the introduction (see, Kamin and von Keist (1999), on one hand, and Herrera and Perry (2000), on the other). While examining the determinants of this time-varying relationship is beyond the scope of this paper, we will now examine whether hikes in interest rates in financial centers are transmitted more strongly to

[7] Kaminsky and Reinhart (2000b) analyze why some crises become systemic while some others are confined to the national borders or at most are of a regional nature.

vulnerable economies. We divide the sample into two equal parts according to the country ratings. The results indicate that vulnerable economies are more strongly affected by the vagaries of international financial markets than healthier economies. The effect is about 50 percent higher.

Table 5 reports similar estimations for stock market returns. The results are less strong than in the case of sovereign debt. This is not unexpected since assessments on sovereign risk should affect more closely yields on sovereign debt rather than stock returns. Still, stock returns seem to react more strongly to fluctuations in interest rates in financial centers when the economy tends to be more fragile, as captured by low ratings from credit agencies.

B. Event Studies

In the panel estimations, we just focus the instantaneous response of bond and stock markets in emerging economies. To capture whether credit ratings have a persistent effect on the mood of investors, we rely on event-study methods commonly used in the finance literature. The event-study methodology also allows us to examine the claim that rating agencies behave procyclically, upgrading countries in good states and downgrading them in times of crises. Thus, we examine the behavior of asset markets around the time of the rating changes (+/- 10 day-windows). Standard event study methodology requires linking rating events to abnormal returns. That is why we base the event study on the yield spreads between sovereign government debt and the benchmark instruments from industrial countries. In the case of stocks, we use the dollar

"stock spreads" between emerging markets stock prices and the S&P500 U.S. stock market index.

Figures 2 and 3 summarize the event-study results in some detail for the case of domestic upgrades and downgrades. The four plots in each figure show the cumulative abnormal returns over that window around the time of changes in ratings. The panels on the left examine the effects of upgrades while the panels on the right report the effects of downgrades. The top panels examine rating changes of both foreign- and domestic-currency denominated debt, the bottom panels do the same for changes in ratings of just foreign-currency denominated debt. Both figures only look at the responses in the days before and after ratings of the domestic debt. Day zero is the day of changes in ratings.

With respect to the behavior of markets in the days leading to the rating changes, the evidence seem to support the hypothesis that rating agencies may have contributed to amplify the boom-bust pattern in emerging markets. Overall upgrades occur when markets are rallying and downgrades when emerging markets are collapsing. This effect seems to be stronger in the case of downgrades. For example, bond spreads increase up to 9 percent in the 10-days prior to downgrades. Similarly, the stock market spreads decline up to 7 percent. Naturally, these fluctuations could reflect an anticipation effect. Still, we are most inclined to interpret them as evidence of procyclical behavior of rating agencies. In fact, our results are consistent with the findings in Reinhart (2001). In that paper, the author examines whether rating agencies actions anticipated the crises of the 1990s. With a large sample of countries and crises, the author concludes that rating changes far from being leading indicators of crises have turned out to be lagging indicators of financial collapses.

With respect to the aftermath of the rating changes, the results are more ambiguous. We first examine the responses of bond yields. The results suggest an asymmetric response of bond spreads after upgrades and downgrades. In particular, according to this event study analysis, the effects of downgrades tend to be somewhat more sustained while the effects of upgrades are usually reversed within two days. Typically, after experiencing an upgrade, bond spreads decline about 2 percent but within ten days bond spreads increase by about 4 percent, relative to the value at day -10. A different picture emerges from the analysis of downturns. While the contemporaneous reaction is similar to that of an upgrade (the spread changes by about 2 percent), following downgrades, the bond market does not recover. On the contrary, spreads continue to increase by at least 2 percent. The effects are somewhat stronger when we examine downgrades of foreign-currency denominated bonds only. Spreads widened an extra 5 percent. In contrast, the effects of upgrades seem to be long lasting in the stock market, with domestic stock markets gaining an extra 2 percent return relative to that of the stock index in the United States. This is not the case for downgrades.

Figure 4 displays event studies for foreign events. Instead of using as an event upgrades and downgrades on sovereign ratings from the domestic country, the figure displays the behavior of EMBI spreads and stock spreads around upgrades and downgrades of spreads from other emerging markets. The figures on the left display upgrades, while the figures on the right show downgrades. The top panel uses EMBI spreads, while the bottom one uses stock spreads. The results show that foreign-currency upgrades are followed by large decreased in EMBI spreads and large increases in stock

market prices. Foreign downgrades are followed by increases in EMBI spreads although the results are not statistically very important.

5. Conclusions

This paper complements previous research on the effects of credit ratings on financial markets in emerging economies. Most of the previous research has focused on quantifying the effects of changes in ratings of a country on sovereign risk as measured by the yield spread of domestic instruments relative to developed country benchmark instruments. In this paper, not only did we expand this exercise with updated data, but also we tested new hypotheses to have a more complete characterization on the effects of sovereign rating changes. We found that rating changes have effects both on the instruments being rated and on other instruments within the same country. We found that sovereign ratings have a significant impact on stock returns. We also examined whether ratings of other countries' sovereign debt have the potential to trigger contagion in financial markets. We found that rating changes have spillover effects to other countries. The effects tend to be limited to the neighbor countries.

This paper also complements the previous literature on financial market linkages. This literature has examined the effects of changes in interest rates in financial centers. The results in this literature have been mixed, with for example sovereign risk being affected positively by interest rate hikes in some episodes but not in others. One important restriction in all these studies is that country risk obeys a common linear specification. One possibility is that interest rate hikes may have more damaging effects in countries near insolvency or with very fragile economies. We investigated this

possibility and examined whether countries with lower ratings are affected more severely by changes in U.S. interest rates. We found that countries with more vulnerable economies are affected 50 percent more by fluctuations of interest rates in the rest of the world. While our results help to understand better the movements of financial markets in emerging economies, we are far from explaining daily volatility. While this is a hard task not only for developing countries by also for mature markets,[8] there is still room for improvement.

With respect to understanding better the effects of ratings, there are several potential extensions to this paper. We have not examined yet whether changes in ratings have more impact during crisis times than during tranquil times. Other extensions can be addressed with new data. For example, if ratings are informative, it will be instructive to analyze whether sovereign ratings are more informative for less transparent countries than for more transparent countries. Further extensions imply using other ratings, beyond sovereign debt ratings. It would be interesting to work with corporate ratings to investigate whether ratings convey different information for different groups of firms. For example, one can expect that firms issuing ADRs, with more transparent accounting standards and for which more information is available, to be less affected by ratings than firms trading in less transparent local markets. Also, since rating agencies also assess exchange rate risk, we could examine whether these ratings are informative by looking at whether they affect differently countries and companies with different with exchange rate exposure. Also, it would be interesting to examine whether firms producing traded-goods

[8] R^2 in all studies explaining daily variations in stock prices or bond yields is very low.

are less affected by country-risk, that is whether collateral (valued in international markets) can act as a buffer to country-risk changes.

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Table 1
Summary Statistics

The table displays summary statistics for all the observations used in the EMBI spreads and stock returns regressions.

	Mean	Median	Standard Deviation	Minimum	Maximum	Number of Observations
Log change in EMBI spreads	-0.0004	-0.0012	0.0379	-0.4986	0.4652	11,122
Log change in absolute value of EMBI spreads	0.0243	0.0160	0.0291	0.0000	0.4986	11,122
Log change in stock prices	-0.0001	0.0000	0.0257	-0.3947	0.3171	21,788
Log change in absolute value of stock prices	0.0158	0.0095	0.0203	0.0000	0.3947	21,788

Table 2

Total Upgrades and Downgrades by Rating Agency

The table displays the total changes in ratings for long-term sovereign debt in foreign and local currency. The sample used is the one available for stock returns.

Agency	Total changes	Upgrades	Downgrades
Moody's	48	19	29
Foreign currency debt	37	14	23
Local currency debt	11	5	6
S&P's	75	28	47
Foreign currency debt	45	19	26
Local currency debt	30	9	21
Fitch	47	21	26
Foreign currency debt	30	15	15
Local currency debt	17	6	11
Total	170	68	102

Table 3
Total Rating Changes by Country

The table displays the total changes in ratings for long-term sovereign debt in foreign and local currency.

Agency	Total changes	Upgrades	Downgrades
Argentina	5	3	2
Brazil	10	7	3
Chile	4	3	1
Colombia	5	0	5
Indonesia	13	1	12
Korea (South)	18	9	9
Malaysia	11	3	8
Mexico	9	5	4
Peru	1	1	0
Phillipines	4	4	0
Poland	6	6	0
Russia	18	7	11
Taiwan	0	0	0
Thailand	10	2	8
Turkey	4	1	3
Venezuela	5	2	3
Total	123	54	69

Table 4
Panel Estimates
Dependent Variable: Log Change in EMBI Spreads

The table reports panel estimates with robust standard errors, using the White correction for heteroskedasticity. T-statistics are in parenthesis. The instrumental variables (IV) estimation (specification 6) uses a second lag of the lagged dependent variable as an instrument. *,**,*** indicate 10,5,1 percent level of significance respectively. The change in ratings describe upgrades and downgrades on sovereign debt from different countries (any, domestic, foreign, regional, non-regional). "Foreign and domestic currency" denote foreign-currency and domestic-currency debt. See the main text for more information on how these variables are constructed.

Explanatory Variables	**Alternative Specifications**					
	1	**2**	**3**	**4**	**5**	**6 IV**
Lagged dependent variable	0.040 *	0.040 *	0.040 *	0.040 *	0.041 *	-0.482
	(1.906)	(1.909)	(1.900)	(1.894)	(1.923)	(-1.156)
Change in ratings:						
Any country, foreign and domestic currency	-0.005 ***					
	(-3.415)					
Domestic country, foreign and domestic currency		-0.025 ***				
		(-3.079)				
Domestic country, foreign currency			-0.032 ***	-0.032 ***	-0.032 ***	-0.029 ***
			(-3.943)	(-3.988)	(-3.994)	(-3.73)
Domestic country, domestic currency			0.008 *	0.008	0.008	0.002
			(0.580)	(0.558)	(0.560)	(0.138)
Foreign countries, foreign and domestic currency		-0.004 **				
		(-2.574)				
Foreign countries, foreign currency			-0.003			
			(-1.593)			
Foreign countries, domestic currency			-0.002			
			(-0.938)			
Regional countries, foreign and domestic currency						
Regional countries, foreign currency				0.000	0.000	-0.001
				(-0.144)	(-0.145)	(-0.318)
Regional countries, domestic currency				-0.008 *	-0.008 *	-0.014 **
				(-1.911)	(-1.904)	(-2.120)
Non-regional countries, foreign and domestic						
Non-regional countries, foreign currency				-0.004 *	-0.004 *	-0.002
				(-1.921)	(-1.880)	(-0.933)
Non-regional countries, domestic currency				0.001	0.001	0.005
				(0.258)	(0.278)	(1.005)
Change in U.S. interest rates:						
Change in U.S. interest rates	0.029 ***	0.029 ***	0.029 ***	0.029 **		
	(2.747)	(2.746)	(2.761)	(2.747)		
Change in U.S. interest rates * high ratings					0.024	0.046 *
					(1.577)	(1.714)
Change in U.S. interest rates * low ratings					0.035 **	0.068 **
					(2.348)	(2.490)
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	(-1.105)	(-1.025)	(-1.020)	(-1.029)	(-0.940)	(-0.764)
R-squared	0.004	0.005	0.005	0.005	0.006	0.006
Number of Observations	11,122	11,122	11,122	11,122	10,923	10,408

Table 5
Panel Estimates
Dependent Variable: Log Change in Stock Prices

The table reports panel estimates with robust standard errors, using the White correction for heteroskedasticity. T-statistics are in parenthesis. The instrumental variables (IV) estimation (specification 6) uses a second lag of the lagged dependent variable as an instrument. *,**,*** indicate 10,5,1 percent level of significance respectively. Th change in ratings describe upgrades and downgrades on sovereign debt from different countries (any, domestic, foreign, regional, non-regional). "Foreign and domestic currency" denote foreign-currency and domestic-currency debt. See the main text for more information on how these variables are constructed.

Explanatory Variables	**Alternative Specifications**					
	1	**2**	**3**	**4**	**5**	**6 IV**
Lagged dependent variable	0.089 ***	0.088 ***	0.088 ***	0.088 ***	0.088 ***	0.337
	(4.462)	(4.435)	(4.430)	(4.416)	(4.409)	(1.568)
Change in ratings:						
Any country, foreign and domestic currency	0.002 ***					
	(3.496)					
Domestic country, foreign and domestic currency		0.007 *				
		(1.770)				
Domestic country, foreign currency			0.004	0.003	0.003	0.003
			(1.139)	(0.868)	(0.865)	(0.629)
Domestic country, domestic currency			0.006	0.006	0.006	0.000
			(0.812)	(0.800)	(0.865)	(0.045)
Foreign countries, foreign and domestic currency		0.002 ***				
		(3.186)				
Foreign countries, foreign currency			0.002 **			
			(2.015)			
Foreign countries, domestic currency			0.001			
			(1.219)			
Regional countries, foreign and domestic currency						
Regional countries, foreign currency				0.006 ***	0.006 ***	0.005 **
				(3.441)	(3.467)	(2.243)
Regional countries, domestic currency				0.000	0.000	0.000
				(-0.056)	(-0.080)	(-0.204)
Non-regional countries, foreign and domestic						
Non-regional countries, foreign currency				0.000	0.000	0.000
				(-0.159)	(-0.164)	(-0.351)
Non-regional countries, domestic currency				0.002 *	0.002 *	0.002
				(1.952)	(1.951)	(1.508)
Change in U.S. interest rates:						
Change in U.S. interest rates	-0.009 **	-0.009 **	-0.009 **	-0.009 **		
	(-2.509)	(-2.509)	(-2.538)	(-2.564)		
Change in U.S. interest rates * high ratings					-0.007	-0.007
					(-1.280)	(-0.963)
Change in U.S. interest rates * low ratings					-0.012 **	-0.011 *
					(-2.245)	(-1.797)
Constant	0.000	0.000	0.000	0.000	0.000	0.000
	(-0.133)	(-0.116)	(-0.068)	(-0.071)	(-0.186)	(0.283)
R-squared	0.009	0.009	0.009	0.010	0.010	0.010
Number of Observations	21,788	21,788	21,788	21,788	21,247	20,508

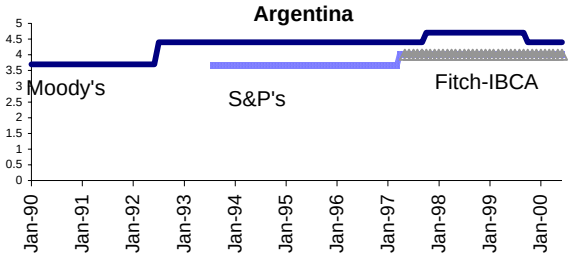
Table 6
Number Clean Events by Country

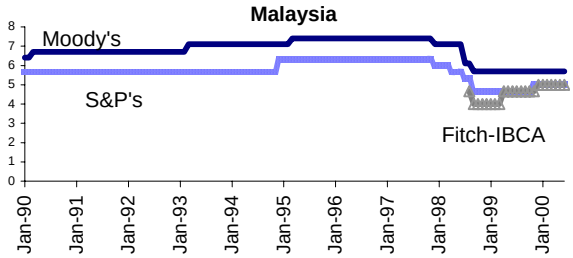
Events are for 10-day windows, including foreign-currency and domestic-currency debt. The events are for domestic country events. The sample used is the one available for stock returns.

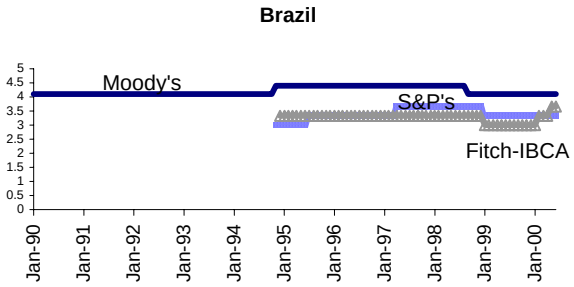
	Total events	**Upgrades**	**Downgrades**
Latin America			
Argentina	3	1	2
Brazil	5	4	1
Chile	3	2	1
Colombia	5	0	5
Mexico	3	1	2
Peru	1	1	0
Venezuela	3	1	2
Total	23	10	13
East Asia			
Indonesia	5	1	4
Korea	8	7	1
Malaysia	7	3	4
Philippines	4	4	0
Taiwan	0	0	0
Thailand	7	1	6
Total	31	16	15
Eastern Europe			
Poland	5	5	0
Russia	12	7	5
Turkey	2	1	1
Total	19	13	6
Gran Total	**73**	**39**	**34**

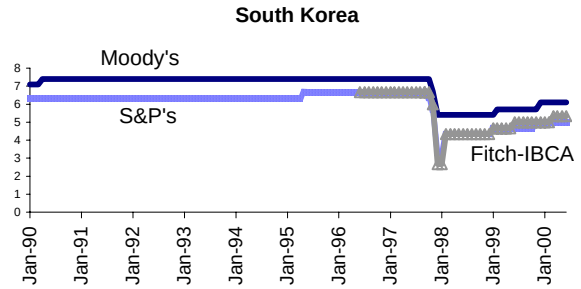
Figure 1
Ratings of Foreign Currency Sovereign Debt for Selected Countries

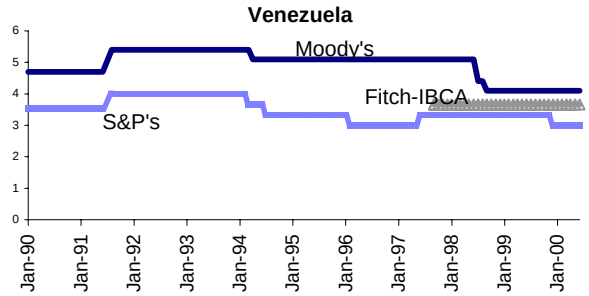
The figures report the sovereign ratings from three credit rating agencies for a selected group of countries. Sovereign letters are published in letters (AAA, Aaaa3SS,....). The scale is different for each agency. Appendix Table 2 gives a mapping between each rating letters and a numerical scale.











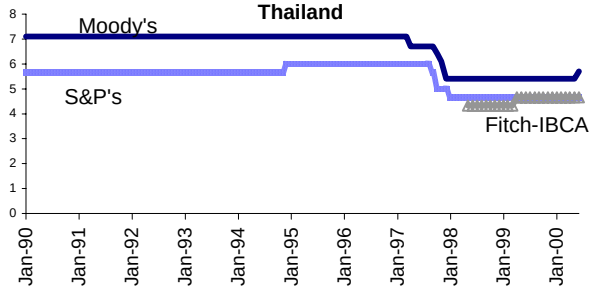
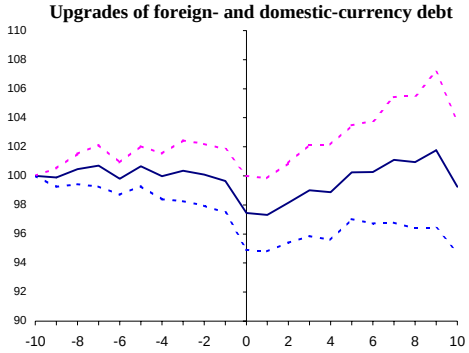


Figure 2

Event Studies of EMBI Spreads

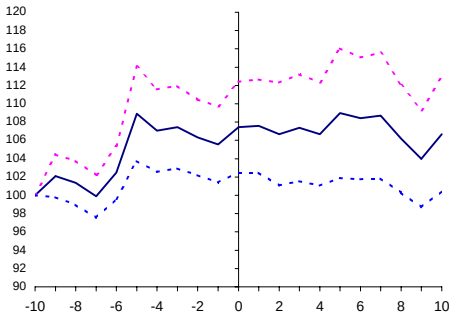
The figures display the log of EMBI spreads (normalized to 100 at day -10), +/- one standard deviation. The events are only related to upgrades and downgrades in the domestic country.

Upgrades of foreign- and domestic-currency debt



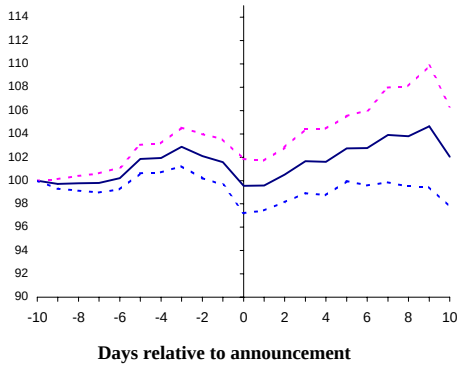
Number of clean events: 28

Downgrades of foreign- and domestic-currency debt



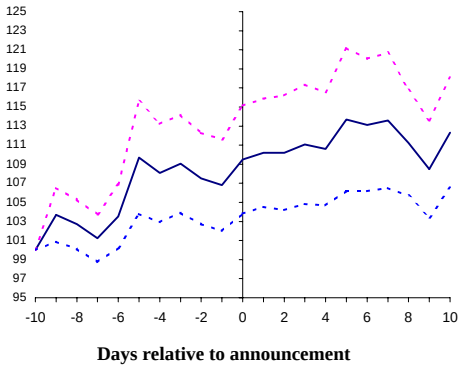
Number of clean events: 17

Upgrades of foreign-currency debt



Number of clean events: 22

Downgrades of foreign-currency debt

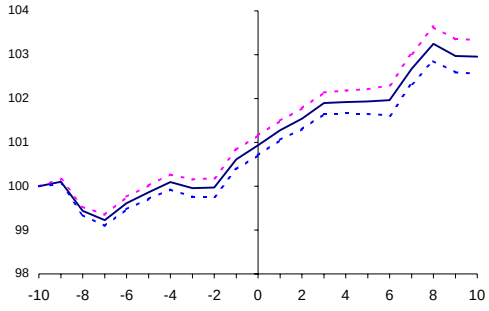


Number of clean events: 14

Figure 3
Event Studies of Stock Market Indexes

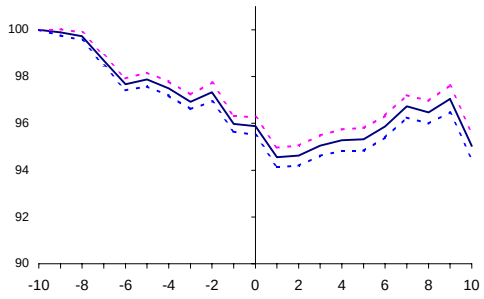
The figures display the log of local stock market index relative to the U.S. S&P 500 (normalized to 100 at day -10), +/- one standard deviation. The events are only related to upgrades and downgrades in the domestic country.

Upgrades of foreign- and domestic-currency debt



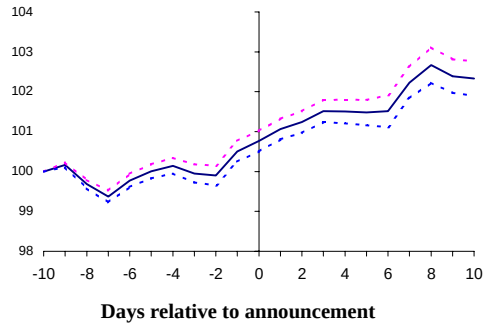
Number of clean events: **39**

Downgrades of foreign- and domestic-currency debt



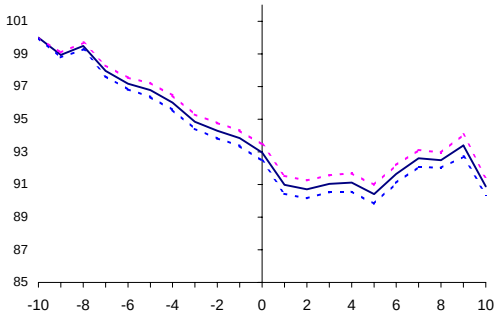
Number of clean events: **34**

Upgrades of foreign- and domestic-currency debt



Number of clean events: **35**

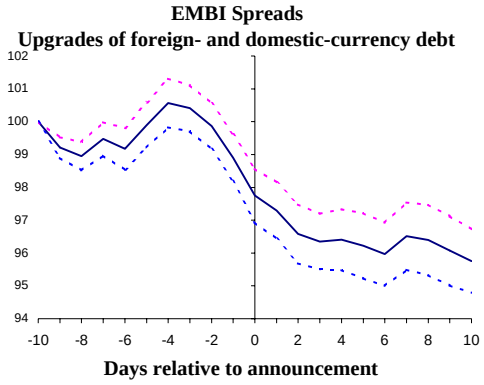
Downgrades of foreign- and domestic-currency debt



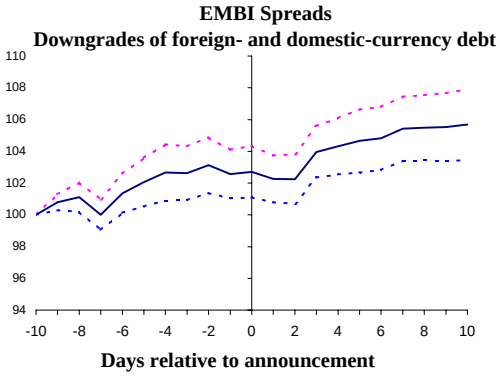
Number of clean events: **23**

Figure 4
Event Studies -- Foreign-Country Events

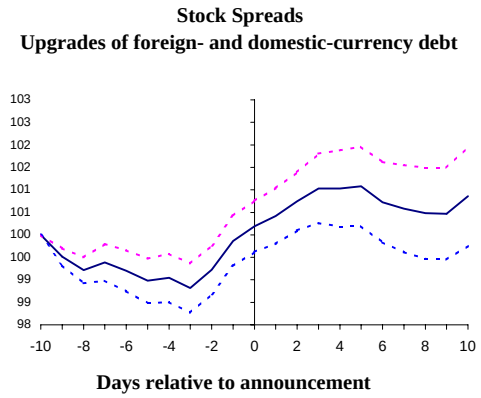
The top panel displays EMBI spreads, while the bottom panel diplays stock spreads , i.e. the log of local stock market index relative to the U.S. S&P 500 (normalized to 100 at day -10). Both panels also plot +/- one standard deviation. The events are only related to upgrades and downgrades in foreign countries, both on foreign-currency and domestic-currency debt.



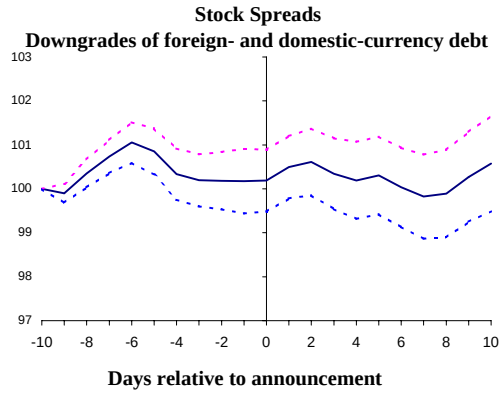
Number of clean events: **99**



Number of clean events: **63**



Number of clean events: **84**



Number of clean events: **116**

Appendix Table 1
Data Availability

Country	EMBI Spreads		Stock Returns		Sovereign Ratings	
	Initial date	End date	Initial date	End date	Initial date	End date
Argentina	April 30, 1993	June 30, 2000	January 3, 1992	June 30, 2000	January 1, 1990	June 30, 2000
Brazil	December 31, 1991	June 30, 2000	January 23, 1992	June 30, 2000	January 1, 1990	June 30, 2000
Chile			January 2, 1992	June 30, 2000	December 7, 1992	June 30, 2000
Colombia			January 2, 1996	June 30, 2000	January 1, 1990	June 30, 2000
Indonesia			November 5, 1991	June 30, 2000	December 7, 1992	June 30, 2000
Korea	April 30, 1998	June 30, 2000	June 30, 1995	June 30, 2000	January 1, 1990	June 30, 2000
Malaysia			June 30, 1995	June 30, 2000	January 1, 1990	June 30, 2000
Mexico	December 31, 1991	June 30, 2000	January 2, 1995	June 30, 2000	December 18, 1990	June 30, 2000
Peru	May 30, 1997	June 30, 2000	January 2, 1996	June 30, 2000	February 5, 1996	June 30, 2000
Philippines	January 4, 1993	January 30, 1997	January 4, 1993	June 30, 2000	June 30, 1993	June 30, 2000
Poland	January 17, 1995	June 30, 2000	April 3, 1996	June 30, 2000	June 1, 1995	June 30, 2000
Russia	December 31, 1997	June 30, 2000	December 1, 1993	June 30, 2000	April 11, 1994	June 30, 2000
Taiwan			January 2, 1996	June 30, 2000	January 1, 1990	June 30, 2000
Thailand			January 2, 1996	June 30, 2000	January 1, 1990	June 30, 2000
Turkey			June 30, 1995	December 30, 1999	May 5, 1992	June 30, 2000
Venezuela	December 31, 1991	June 30, 2000	April 23, 1996	June 30, 2000	January 1, 1990	June 30, 2000

Appendix Table 2
Scale of Ratings for Sovereign Debt

Moody's				S&P		FITCH- IBCA	
Rating	**Number**	**Rating**	**Number**	**Rating**	**Number**	**Rating**	**Number**
Aaa3SS	8.5	Ba2	5.1	AAA	8	AAA	8
Aaa3S	8.8	Ba1SS	5.3	AA+	7.33	AA+	7.33
Aaa3	8.7	Ba1S	5.5	AA	7	AA	7
Aaa2SS	8.9	Ba1	5.4	AA-	6.66	AA-	6.66
Aaa2S	9.2	Ba	5	A+	6.33	A+	6.33
Aaa2	9.1	B3SS	3.5	A	6	A	6
Aaa1SS	9.3	B3S	3.8	A-	5.66	A-	5.66
Aaa1S	9.5	B3	3.7	BBB+	5.33	BBB+	5.33
Aaa1	9.4	B2SS	3.9	BBB	5	BBB	5
Aaa	9	B2S	4.2	BBB-	4.66	BBB-	4.66
Aa3SS	7.5	B2	4.1	BB+	4.33	BB+	4.33
Aa3S	7.8	B1SS	4.3	BB	4	BB	4
Aa3	7.7	B1S	4.5	BB-	3.66	BB-	3.66
Aa2SS	7.9	B1	4.4	B+	3.33	B+	3.33
Aa2S	8.2	B	4	B	3	B	3
Aa2	8.1	Caa3SS	2.5	B-	2.66	B-	2.66
Aa1SS	8.3	Caa3S	2.8	CCC	2	CCC+	2.33
Aa1S	8.5	Caa3	2.7	CC	1	CCC	2
Aa1	8.4	Caa2SS	2.9			CCC-	1.66
Aa	8	Caa2S	3.2			CC	1.33
A3SS	6.5	Caa2	3.1			C	1
A3S	6.8	Caa1SS	3.3				
A3	6.7	Caa1S	3.5				
A2SS	6.9	Caa1	3.4				
A2S	7.2	Caa	3				
A2	7.1	Ca3SS	1.5				
A1SS	7.3	Ca3S	1.8				
A1S	7.5	Ca3	1.7				
A1	7.4	Ca2SS	1.9				
A	7	Ca2S	2.2				
Baa3SS	5.5	Ca2	2.1				
Baa3S	5.8	Ca1SS	2.3				
Baa3	5.7	Ca1S	2.5				
Baa2SS	5.9	Ca1	2.4				
Baa2S	6.2	Ca	2				
Baa2	6.1	C3SS	0.5				
Baa1SS	6.3	C3S	0.8				
Baa1S	6.5	C3	0.7				
Baa1	6.4	C2SS	0.9				
Baa	6	C2S	1.2				
Ba3SS	4.5	C2	1.1				
Ba3S	4.8	C1SS	1.3				
Ba3	4.7	C1S	1.5				
Ba2SS	4.9	C1	1.4				
Ba2S	5.2	C	1				

Source: Bloomberg